

Blurb for summary of NEMO3D results for the Sandia HPC Annual Review:  
Ines Montano and Rick Muller

We have been using RedSky to investigate the physics of donor atoms in silicon for use as qubits for quantum computing. Quantum computing promises to dramatically change the performance of certain algorithms; this work is part of a quantum computing project led by Malcolm Carroll. We have investigated the magnitude of energy barriers for transferring electrons between donor centers and to electrostatically-defined quantum dots at the silicon oxide interface. Understanding these barriers helps us design structures that we think will be robust to noise and decoherence effects, and will help us understand experimental results as we build preliminary structures. There are only a few other research groups in the world conducting research along these lines. The work has been an important element of understanding the design principles that constrain computing devices at low temperature. We will continue this work in the future, in particular to analyze experimental results we anticipate coming from CINT collaborators.